M E M O R A N D U M

DATE: July 28, 2008

TO: Rose Longoria, Yakama Nation Fisheries Resource Management Program

FROM: Robert Dexter, Ph.D., RIDOLFI Inc.
Sheila Fleming, P.E., RIDOLFI Inc.

SUBJECT: Comments on *EPA Comments Appendix E: Round 2 Comprehensive Site Characterization Summary and Data dated July 16, 2008*

Ridolfi has reviewed EPA's draft comments as well as the comments provided by Jennifer Peterson and Larry Burkhard. We agree that the major issues with the current effort include the changes made to the "internal" parameters, the lack of spatially relevant exposure scenarios, and the use of the limited available tissue data to calibrate the model. We also feel that, given the limited data available to verify the model, it should clearly be considered a comparatively weak tool for developing sediment PRGs or estimating the results of future clean up actions.

The Gobas and Arnot model selected may be overly and unnecessarily complex for the intended use. While the model incorporates physiologically reasonable factors, there are limited data available to determine the appropriate value for those factors. Each of the parameters in the model is subject to some level of best professional judgment, making it difficult to come to a final agreement on the most appropriate model. Most important, in the end, it will be nearly impossible to determine the accuracy of the model. We concur with the more specific concerns that have been identified:

- The quantity and quality of input data. There are two basic types of data needed for the model: concentrations of the chemical in the sediment and water sources and a series of physical, chemical, and biological parameters that control the distribution of the chemical in different "boxes." Limits on identifying and selecting the appropriate data obviously affect the accuracy of the model output.
- It is an equilibrium, steady-state model. In the river environment, the exposure conditions may fluctuate on time scales less that those required to reach steady state in the accumulation of some chemicals in some organisms.
- Similarly, the model as currently used does not address spatial variability.
- Water and sediment concentrations are not related in the model. The link to a separate fate-and-transport component complicates the accurate estimation of the input concentrations for water and sediment.

We also share the concerns regarding changes made by LWG to some of the "internal" parameters developed by Gobas and his collaborators for the recent model. We do not believe that it is appropriate for LWG to "tweak" the model to achieve the most precise calibration of the model to the tissue data available, including adjusting parameters for which they had no better empirical data, and certainly no site-specific data, to justify the changes from the values in the original model. Overall, it would be better to not adjust any parameter in the model for which there was no reliable site-specific data available to provide a better estimate, and to more critically examine the empirical data that are available to select the most appropriate values. Even without changing the "internal" parameters, there are numerous other parameters that have ranges that can be adjusted to achieve a calibrated model. Specific concerns include:

- LWG should not base the parameterization of the model on the calibration, but use the unaltered model with better evaluation of the site-specific empirical data
- Better refinement of water (including pore water) concentrations
- Do not use means and site-wide averages but develop more realistic exposure scenarios

We also agree that substances that occur as mixtures, e.g., PCBS and the TEQ compounds, should be modeled as individual chemicals and then combined after modeling to estimate and totals. As suggested in previous discussions, approaches such as K_{ow} bracketing can be tried. The issue of modeling mixtures is one that seems especially appropriate for "what-if" types of modeling to attempt to discern the factors most likely contributing to poor reliability in the modeling.

Finally, we share the concern with the treatment of the reliability and uncertainty of the model. On the one hand, because of the large number of parameters in the model for which the accuracy of the value is basically unknown, "uncertainty" cannot really be assessed—only the ranges of the model output. By comparing the model output to the site data, estimates of reliability can be made. To do this, it is importance to use as little of the site biota tissue data to calibrate the model as possible in the model development so that those data an be used to assess the reliability of the model and to determine the sensitivity of the model to changes in the parameters and source terms. Bases on those trials, more considered judgments can be made regarding changes to the model that might improve the reliability. Simply getting the model output to match a set of data is not a good indicator that the model is doing what you hope it is, i.e., predicting the tissue concentration based on the modeled response to the source concentrations, particularly if the same data are used in making the model match.

In agreement with EPA's comments, we suggest that LWG use the unaltered GA model. We further suggest that the model be used first as a tool for "what-if" and sensitivity analyses for selected important parameters, using the available tissue data as the reference comparison point as Gobas suggests—compare predictions to actual concentrations. In adjusting those parameters, a preference should be given to those for which there are site-specific data to guide the range, based on careful analyses of those empirical data, i.e., play with the factors we know something about, for example:

Lipid content

Food preference

Water concentrations

Spatially relevant exposures

Based on the results of these test runs, the model can be refined to demonstrate that it does reasonably well predicting the tissue to sediment dependence. The important use of the model is not that it can accurately predict the future concentrations in the biota tissue as much as it needs to predict the *trends* in those concentrations in response to changes in sediment concentrations from proposed cleanup activities.